EXHIBIT 6

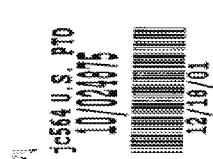**to T-Mobile's Responsive Claim Construction Brief**

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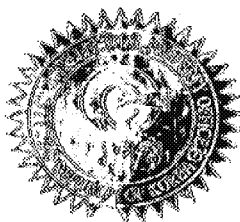
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[Title of the invention]	Optimal internet network access and roaming system and method for users moving indoors/outdoors
[Title of the invention in English]	System and method for connecting and roaming between wireless and wired internet for moving internet user from/to outdoor to/from indoor
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44-2

[Abstract]

[Abstract]

The present invention relates to an optimal internet network access and roaming system and method for users moving indoors/outdoors.

The present invention receives a communication service by accessing the outdoor wireless internet network, such as the outdoor wireless LAN or packet network, from outdoors, and then, when the indoor system ID information is received, determines whether the received indoor system ID matches the registered indoor system ID. If the two IDs match, it registers the indoor location on the location register and obtains approval, switches the connection from the outdoor wireless internet network to the indoor gateway, and connects to the internet network by wireless communication through the indoor gateway and indoor wireless access module. In addition, when data provided from the internet network according to the location information registered in the location register is transmitted to the indoor gateway, the data is provided through the indoor gateway and the indoor wireless access module, and then, if the indoor system ID information is not received, the outdoor location is received and approved in the location register, and its connection is switched to the outdoor wireless internet network.

[Representative figure]

Fig. 2

[Keywords]

Outdoor wireless LAN, Bluetooth, indoor wireless LAN access module, connection switching, indoor network, indoor gateway

[Specification]

[Title of the invention]

Optimal internet network access and roaming system and method for users moving indoors/outdoors {system and method for connecting and roaming between wireless and wired internet for moving internet user from/to outdoor to/from indoor}

[Brief description of figures]

Figs. 1a and 1b are diagrams showing an example of a configuration of an outdoor wireless internet network applied to the present invention.

Fig. 2 is a configuration diagram of an optimal wireless internet network access and roaming system for users moving indoors/outdoors according to an embodiment of the present invention.

Fig. 3 is a flowchart for providing a connection switching service when the location is moved from outdoors to indoors during a wireless internet call according to an embodiment of the present invention.

Fig. 4 is a flowchart for providing a connection switching service when the location is moved from outdoors to indoors during wireless data communication according to an embodiment of the present invention.

Fig. 5 is a flowchart for providing a connection switching service when the location is moved from indoors to outdoors during a wireless internet call according to an embodiment of the present invention.

Fig. 6 is a flowchart for providing a connection switching service when the location is moved from indoors to outdoors during a wireless data communication according to an embodiment of the present invention.

[Detailed description of the invention]

[Object of the invention]

[Technical field to which the invention pertains and prior art in the field]

<7>   The present invention relates to wireless mobile communication, and in particular, to an optimal internet network access/roaming system and method for enabling connection switching according to the location of the user by allowing connection to the wired internet network through the indoor wireless access module if the wireless data communication terminal is located indoors, and allowing connection to the wireless internet network if it is located outdoors.

<8>   Currently, the internet is used as an essential communication medium for modern people, the provision of information and confirmation of information through the internet has been generalized, and its degree of application is gradually expanding.

<9>   In order to use the internet, a terminal (computer, PCS phone, cellular phone, laptop PC, PDA, etc.) with a built-in chip or device capable of accessing the internet is required, and the method for accessing the internet differs depending on the terminal. For example, a computer or a laptop PC connects to the internet through a wired line, and a PCS phone, a cellular phone, and a PDA connects to the internet based on a wireless communication protocol. In some cases, a computer or a laptop PC can have a PCS phone connected to connect to the internet through wireless communication.

<10>   Concerning the methods for accessing the internet by wireless communication, there are methods such as a method for accessing the internet by using an external mobile communication network such as a base station, a base station controller, and a switchboard, a method for accessing the internet through an outdoor wireless LAN (local area network) using a wireless LAN card, and a method for accessing the internet through a wireless packet network.

<11> Dual wireless LAN is a data communication implemented based on the idea of being an extension or replacement of wired LAN, and the most common is the spread spectrum type wireless LAN using the ISM band (902-928 MHz, 2.4-2.48 GHz, 5.725-5.85 GHz) in consideration of range, performance, security, and so forth by the method of transmitting and receiving data in the air using radio frequency or infrared rays without using cables (10/100Base).

<12> In addition, the wireless packet internet network provides internet service in a packet method using a 900 MHz band and a 1.8-2 GHz band.

<13> In general, a wired LAN user connects to a LAN server through a wired cable using a computer or a laptop PC indoors, and also, connects to the external internet. In addition, the users of an outdoor wireless LAN network or a wireless packet internet network access the internet using a network consisting of an antenna, an access point, a router (or a hub or a bridge), and so forth by using a PDA, a laptop PC with a wireless internet access module inserted, and so forth outdoors and indoors.

<14> However, when using a wired LAN, the user only has to pay the amount agreed upon with the business operator, but when using a wireless LAN, the user has to pay the amount in proportion to the number of times they connect to the internet. Furthermore, since the internet usage fee through a wireless LAN is expensive, using a wired LAN is more economically advantageous than using a wireless LAN when calculated on a monthly basis.

<15> Therefore, there is a problem in that users using a wireless LAN feel a greater financial burden than those using a wired LAN. In addition, if a wireless LAN or a packet module is used rather than a wired LAN, there is a problem in that the quality and speed of information deteriorate.

[Technical problems to be solved by the invention]

<16>   The present invention is to solve the problems of the prior art, and its object is to achieve connection switching that allows connection to the internet using an indoor wired LAN if the mobile data communication terminal is indoors, and allows connection to the internet using an outdoor LAN network or an outdoor wireless internet network of a wireless packet network if the mobile data communication terminal is outdoors.

<17>   In addition, an object of the present invention is to enable incoming connections at a low cost regardless of whether the user is indoors or outdoors.

<18>   In addition, an object of the present invention is to provide a service through another outdoor network for transmission and reception in the event of traffic congestion in an indoor network or a failure that makes it impossible to provide the service.

[Configuration and operation of the invention]

<19>   The present invention for solving the above technical problems,

<20>   allows a network path (i.e., connection of a communication network) capable of connecting to the internet or the PSTN to be different depending on whether the user is outdoors or indoors. In other words, if the user is indoors, the user's wireless internet terminal is connected to the indoor wired LAN, and if the user is outdoors, the user's wireless internet terminal is connected to a wireless LAN network, or an outdoor wireless internet network (a network capable of accessing the internet wirelessly) such as a wireless packet network. By switching network connection according to the user's location status or location movement, the user can be guaranteed better call quality at a low cost. In this case, depending on whether the user is indoors or outdoors, the roaming service is performed according to the optimal network path.

<21>   The present invention embeds an indoor wireless access module in a device connected to a wired LAN, that is, an indoor gateway (including internet communication equipment) so that the user's wireless internet terminal can access the indoor wired LAN, and also, this enables wireless communication between two communication devices indoors by embedding an indoor wireless access module in the wireless internet terminal.

<22>   Here, the indoor wireless access module is a device that enables communication of data, voice, and so forth, between communication devices at a short distance, and enables wireless communication between wireless internet terminals and home, communication, and computer devices by generally being embedded in wireless internet terminals, such as PDAs, laptop PCs, PCS phones, and cellular phones, and indoor home, communication, and computer devices, such as desktop computers, scanners, TVs, and printers, that are located indoors.

<23>   Therefore, the indoor wireless access module may be Bluetooth, a wireless LAN access module, or a wireless packet communication access module.

<24>   The present invention provides a location register for storing location information transmitted from the wireless internet terminal to check whether the user of the wireless internet terminal is indoors or outdoors. In the present invention, the network path for the roaming service is different depending on the location information stored in the location register.

<25>   The wireless internet terminal determines whether the indoor system ID information broadcast from the indoor gateway is being received and, in particular, whether the received indoor system ID information is the same as the stored information to determine whether the current location is indoors or outdoors.

<26>   Therefore, the optimal mobile communication network access and roaming system for users moving indoors/outdoors according to the characteristics for solving said technical problems includes:

<27>   A data communication terminal having a built-in indoor wireless access module, registered with indoor system IDs, operating the indoor wireless access module by setting the indoor access mode when the registered indoor system ID information is received, and connecting to an outdoor wireless internet network by setting the outdoor communication mode when the registered indoor system ID information is not received;

<28>   An indoor gateway having the built-in indoor wireless access module to perform wireless communication with a wireless internet terminal, broadcasting the indoor system ID information, and wire-connected to an internet network;

<29>   A location register for storing location information of the data communication terminal transmitted from the data communication terminal to the outdoor wireless internet network; and

<30>   A location checker (internet switchboard) for determining the location of the data communication terminal stored in the location register and judging the voice/data signal provided to the user to select either an outdoor network or an indoor network, depending on the location of the data communication terminal, and then perform roaming.

<31>   The location information is information on the location area when the data communication terminal is outdoors, and indoor system ID information when it is indoors.

<32> On the other hand, the optimal mobile communication network access and roaming method for users moving indoors/outdoors according to another characteristic of the present invention for solving said technical problems comprises,

<33> In the optimal internet network access and roaming method for users using a communication system comprising an antenna, a router, an outdoor wireless internet network comprising a location register, and an indoor network comprising an indoor gateway capable of accessing the internet network,

<34> A first step for accessing the outdoor wireless internet network from outdoors to receive a communication service;

<35> A second step for determining whether the received indoor system ID matches the registered indoor system ID when the indoor system ID information is received after the first step;

<36> A third step for registering the indoor location on the location register and obtaining approval if the two IDs match;

<37> A fourth step for switching connection from the outdoor wireless internet network to the indoor gateway, and connecting to the internet network through communication by the indoor gateway and the indoor wireless access module;

<38> A fifth step for receiving the data by wireless communication through the indoor gateway and the indoor wireless access module when the data provided by the internet is transmitted to the indoor gateway according to the location information registered in the location register;

<39> A sixth step for registering the outdoor location on the location register and obtaining approval if the indoor system ID information is not received after the fifth step; and

<40> A seventh step for switching connection from the indoor gateway to the outdoor wireless internet network, and performing the first step.

<41> It is preferable that the indoor location registered in the location register includes the indoor system ID.

<42> Hereinafter, a method for switching connection to indoor and outdoor wireless internet networks when moving to an indoor/outdoor location according to an embodiment of the present invention will be described with reference to the accompanying figures.

<43> First, the present invention uses the indoor wireless access module and the indoor gateway (internet communication equipment or gateway, such as home gateway and IAD, that are located inside the house, building, and structure) for indoors, and uses the outdoor wireless internet network that is generally used for outdoors. Therefore, the present invention switches the network access from being connected to a general outdoor wireless internet network to an indoor communication network in which communication is performed through an indoor wireless access module when the user moves from outdoors to indoors.

<44> On the other hand, when the user moves from indoors to outdoors, the connection is switched from the indoor communication network using the indoor wireless access module to the general wireless internet network.

<45> Here, Bluetooth, which is an indoor wireless access module; wireless LAN access module; wireless packet communication access module; and home gateway will be described.

<46> Bluetooth is a short-range wireless communication technology that enables multi-purpose connection regardless of the types of existing communication devices, home appliances, and office devices. This Bluetooth was developed for the purpose of making wired cables for data communication connecting mobile phones, PCs, digital still cameras, printers, personal digital assistants (PDA), and game consoles, wireless; currently, five companies including Ericsson of Sweden, IBM Corp. of the US, Intel Corp. of the US, Nokia of Finland, and Toshiba lead the standardization work, and various companies including Ericsson and CSR manufacture Bluetooth chips.

<47>   The network created by Bluetooth that supports communication between various types of devices is called "WPAN (Wireless Personal Area Network)". In the environment established by WPAN, an information device carried by a user becomes wirelessly connected to another information device in the vicinity by the Bluetooth method. This makes it possible for a personal digital assistant, which previously functioned independently, to work in concert with a peripheral device or a device connected to an external network to realize functions that are convenient to users and advanced functions that have been difficult to realize up to the present time.

<48>   To this end, Bluetooth uses the 2.4 GHz band, which is an ISM (industrial scientific medical) band, which is a license-free band for worldwide operation. In addition, the Bluetooth channel uses a FH/TDD (frequency-hop/time-division-duplex) method, the channel is divided into 625 msec intervals called slots, different hop frequencies are used for each slot, and the hop rate is 1,600 hops/sec. The slots are transmitted in the TDD mode and alternate between transmission and reception.

<49> In order for a user to use Bluetooth through an application program, software for controlling RF (radio frequency) and baseband signal processing hardware, and connecting it to the application program is required. In the Bluetooth specification, the software protocol used for this purpose is described by being stratified, and since this is already widely known, it will not be described any further.

44-12

<50> The wireless LAN access module is a device that allows data communication between short-range communication devices to follow the wireless LAN method, and the wireless mobile communication packet is a device that enables wireless communication between short-range communication devices excluding a wireless LAN packet and Bluetooth, or between a communication device and a wireless communication terminal.

<51> The wireless packet communication packet refers to mobile packet data modules, such as bidirectional pager module, wireless data module, GPRS, EDGE, 95C1X, 95C1XEVDO (HDR), and 95C1XEVDO, and data information is transmitted and received between the terminal and the base station (access point) by a wireless packet method.

<52> In addition, the Home Gateway (hereinafter referred to as "HG") is a key device for home informatization that connects the wired/wireless access network (subscriber network) and the indoor (indoor) network, and is equipment that interconnects and mediates indoor network equipment, such as Bluetooth and Home PNA (Phoneline Networking Alliance) for connecting two or more terminals installed indoors to wired and wireless communication networks and subscriber networks using ADSL (asymmetric digital subscriber line), CATV network, and so forth.

<53> It not only provides high-speed internet service and real-time multimedia service, but also provides various additional services, such as sharing of indoor resources, entertainment using network, education, medical treatment, home shopping, and remote automatic control, home security function, and so forth, using a personal digital assistant.

<54> Therefore, the indoor access network of the present invention allows the communication device of a user that has moved indoors to be connected to the indoor gateway through the indoor wireless access module, and the indoor gateway to be responsible for connecting to the internet network.

<55>   First, a configuration of an outdoor wireless internet network applied to the present invention will be described with reference to Fig. 1. Figs. 1a and 1b are figures showing an example of a configuration of a general outdoor wireless internet network.

<56>   Fig. 1a shows the configuration of an outdoor wireless LAN network and a wireless packet network that connect to the internet through an access point, and the outdoor wireless LAN network comprises a data communication terminal (10), antennas (31, 32), access points (21, 22), a plurality of routers (41, 42, …, 43), and a location register (80). On the other hand, wireless packet communication uses wireless packet access modules, such as 95C1X, 1XEVDO, and 1XEVDV, to provide wireless internet service based on mobile IP, and this wireless packet communication network is composed of an antenna (33), a BTS (Base Transceiver Station) (90), a BSC (Base Station Controller) (911), a router (92), and a location register (80).

<57>   Fig. 1b shows an outdoor LAN network that connects to the internet through a wireless router, and the outdoor wireless LAN network comprises a data communication terminal (10), antennas (34, 35), a subscriber wireless router (44), an edge wireless router (45), a router (46), and a location register (80).

<58>   In Figs. 1a and 1b, each router is connected with one another and connected to the internet, and the internet (50) is connected to the PSTN (70) through a VoIP gateway (60).

<59>   The data communication terminal (10) is a device capable of allowing a PDA, a laptop PC, and so forth carried by a user to transmit and receive data using radio waves as a medium, and has a built-in wireless LAN card.

<60>   The antennas (31, 32, 33) are attached to the access points (21, 22) or the BTS (90), respectively, to allow data to be transmitted and received between the terminal and the access points (21, 22) or the BTS (90).

<61>   The access points (21, 22) are usually installed in structures or buildings, and are connected to a wired LAN and provide data transmission and buffering functions as devices used to connect the existing wired LAN and wireless LAN. One access point supports dozens to hundreds of users and covers up to several kilometers.

<62>   The router serves to send messages on the internet based on information provided by a network protocol. More specifically, hundreds or thousands of computers hold and communicate the designated address in each device with one another. As the network gradually grows, it becomes impossible for each computer on the internet to remember every address. Therefore, it becomes necessary to establish a system so that the computer can communicate with only a small amount of information without holding all address information. Such a system is none other than splitting the internet. Of course, networks are connected to each other. This divided network is called a sub-network, and a special computer for connecting these sub-networks with one another is called a router. By using this method, network computers do not need to know all address information of all network computers, but only need to know its own network on the internet.

<63>   The wireless router is adding a wireless packet to the function of the router.

<64> Therefore, after the outdoor wireless LAN of Fig. 1a connects the internet access request signal (i.e., internet IP address) generated from the data communication terminal (10) to an available wired LAN network through the access point (21 or 22), the process in which the router (41) connected to the wired LAN network transmits an access request signal to a different router (42) and the router (42) transmits the access request signal to another router is continued to ensure that the internet access request signal is transmitted to the router (43) connected to the corresponding internet server. The internet access path is designated by such a plurality of routers (41, 42, …, 43), which enables the user to connect to the internet (50). At this time, the location information of the terminal (10) is registered in the location register (80).

<65>   In addition, when a user uses a wireless packet communication module in Fig. 1a, first, a registration message is transmitted to the location register (80) through the BTS (90), the BSC (91), and the router (92) to register the location based on the mobile IP protocol. The location register (80) identifies the location of the recipient to transmit the information to the corresponding router.

<66>   On the other hand, in the outdoor wireless LAN of Fig. 1b, an edge wireless router designates the access path to the internet server corresponding to the internet access request signal (i.e., internet IP address) generated from the data communication terminal (10). In other words, a process in which a subscriber wireless router (44 or 44') close to the terminal (10) transmits an internet access request signal to the edge wireless router (45) at a remote location through antennas (34, 35), and the edge wireless router (45) transmits it to another router through the router (46) again is continued to ensure that the internet access request signal is transmitted to the router (47) connected to the internet server corresponding to the internet access request signal. The internet access path is designated by such a plurality of wireless routers and routers, which enables the user to connect to the internet (50). [illegible:] [illegible:]

<67>   Here, as shown in Figs. 1a and 1b, in order to connect to an outdoor wireless LAN network or to receive a roaming service through an outdoor wireless LAN network, the current location of a mobile host, that is, a data communication terminal must be registered in a location register. The location register is a home agent or a foreign agent, and a mobile IPv4 or IPv6 address system is used to register a location in this location register.

<68>   Mobile IP supports the mobility of the host by using a foreign agent (FA), which is a mobile agent, a home agent (HA), periodic host location registration of the home agent, and tunneling between mobile agents or between the home agent and mobile host. The mobile host (i.e., data communication terminal) must be assigned a unique IP address to receive a mobile IP service.

<69>   As a method for dynamic address allocation, there is a method for using DHCP (Dynamic Host Configuration Protocol). DHCP is a technique that allows a host to set its own network environment by downloading the environment information of the relevant subnet at the time of initial operation when an arbitrary host connects to a network.

<70>   Therefore, the data communication terminal registers the location using the mobile IP registration message when initially connecting to the outdoor wireless LAN network.

<71>   The usage path of the outdoor wireless LAN network described through Figs. 1a and 1b is merely a known embodiment. [illegible:]

<72>   Hereinafter, an optimal internet network access and roaming system for users moving indoors/outdoors according to an embodiment of the present invention will be described with reference to Fig. 2.

<73>   Fig. 2 is a block diagram of an optimal wireless internet network access and roaming system for users moving indoors/outdoors according to an embodiment of the present invention. As illustrated in Fig. 2, the system of the present invention is, as described in Fig. 1, composed of an outdoor wireless LAN network comprising an access point (22), an antenna (32), and a router (40) or a wireless packet network comprising a BTS (90), a BSC (91), and a router (40), an indoor network comprising an indoor gateway (100), and an external network consisting of a location register (80), the internet comprising a plurality of internet servers (51), a VoIP gateway (60), and a PSTN.

<74>   The outdoor wireless LAN network and the wireless packet network are outdoor wireless internet networks.

<75>   In the description above, the data communication terminal (10) is a PDA or a laptop PC and so forth, has an indoor wireless access module (A) and a wireless LAN card (B) (or a wireless packet access module) built in, and stores one or more indoor system ID information. In addition, the indoor gateway (100) has a built-in indoor wireless access module (C), and its own unique system ID, that is, indoor system ID information is assigned.

<76>   Therefore, the data communication terminal (10) uses a wireless LAN card (B) or a wireless packet access module (not shown) when connecting to an outdoor wireless LAN network, uses an indoor wireless access module (A) when wirelessly communicating with the indoor gateway (100).

<77>   Here, the indoor wireless access module (A, C) is one of: Bluetooth, or a wireless LAN access module, or a wireless packet access module.

<78>   The indoor gateway (100) includes an HG and an integrated access device (hereinafter referred to as "IAD"), and HG is mainly installed and used in a house, and IAD is installed in used in a building or a structure.

<79>   Such an indoor gateway (100) is connected to the data communication terminal (10) and the indoor wireless access module (A, C) to enable the user to connect to the home network or SOHO network and the internet or the PSTN, and broadcasts indoor system ID information at regular intervals through the indoor wireless access module to ensure that the wireless internet terminal (10) located indoors knows the indoor system ID information.

<80>   The location register (80) is a home agent (HA) or a foreign agent (FA) that operates based on a mobile IP protocol and records the current location of a data mobile subscriber.

<81>   The location information stored in the location register (80) is information on the location area when the data communication terminal is outdoors, and is indoor system ID information when it is indoors.

<82>   Hereinafter, a method for switching connection to a wireless internet network when a user moves from outdoors to indoors during a wireless internet phone call using the system of the present invention illustrated in Fig. 2 will be described with reference to Fig. 3.

<83>   Fig. 3 is a flowchart for providing a connection switching service when the location is moved from outdoors to indoors during a wireless call according to an embodiment of the present invention, and is the case in which the indoor access module is Bluetooth. For the data communication terminal applied to Fig. 3, any wireless internet terminal capable of wireless data communication can be used, but a dual PDA will be described as an embodiment to assist in understanding.

<84>   Outdoors, when the user turns on the PDA (10), the PDA (10) is initialized and power is applied (S10).

<85>   Then, the PDA (10) checks whether the received indoor system ID information is being received, and if the registered indoor network system information is not received, it sets the outdoor communication mode and calls the recipient at a remote location using an outdoor wireless LAN network, the internet, a VoIP gateway (60), and a PSTN (70).

<86>   In other words, if the registered indoor network system information is not received, the PDA (10) registers the location by being authenticated by the location register (80) based on the mobile IP message using the path through an antenna (32), an access point (22), and routers (41, 42, 40).

<87>   When the location is registered in the location register (80), the PDA (10) connects to the internet and generates a communication number (i.e., a call message including the recipient number) for the recipient that desires a call. Then, the calling signal of the PDA (10) gets connected to the internet (50) through an outdoor wireless LAN network, and then, connects to the PSTN (70) through the VoIP gateway (60) to be transmitted to the recipient's wired telephone or wireless internet terminal. In addition, the voice data transmitted from the recipient is transmitted to the user's PDA (10) through the outdoor wireless LAN network according to the location registered in the location register (80) to have a call between the user and the recipient (S11). [illegible:] [illegible:]

<88>   After the step (S11), if the user moves from outdoors to indoors while having a voice call or after finishing a voice call, the PDA (10) receives the indoor system ID information broadcasted from the indoor gateway (100) through Bluetooth (A) (S12).

<89>   The PDA (10) compares the received indoor system ID and the stored indoor network ID, and if these match, determines that the user has moved indoors, and registers the location regarding the fact that the user has moved indoors after being authenticated by the location register (80) through the outdoor or indoor wireless LAN network using the mobile IP message.

<90>   When the authentication request is successfully made, the location register (80) confirms that the location of the user has been changed from outdoors to indoors.

<91>   When the PDA (10) receives authentication for location registration, the outdoor mobile communication mode is switched to the indoor Bluetooth mode, which is an indoor connection mode (S14).

<92>   When the PDA (10) switches to the Bluetooth mode in this manner, the PDA (10) can perform wireless communication through the indoor gateway (100) and Bluetooth (A, C).

<93>   Therefore, when the Bluetooth mode is set, the PDA (10) connects to the indoor gateway (100) based on the indoor system ID information and wirelessly communicates with the indoor gateway (100) through Bluetooth (A, C) (S15).

<94>   Since the indoor gateway (100) is connected to the internet (50) by wire, it connects the PDA (10) and the internet (50). In addition, the internet (50) transmits the voice data signal generated by the PDA (10) to the VoIP gateway (60) according to the request of the PDA (10), and the VoIP gateway (60) converts the received voice data signal into a protocol suitable for the PSTN and transmits it to the PSTN (70). Then, the PSTN (70) transmits the signal received from the VoIP gateway (60) to the corresponding recipient's terminal (S16).

<95>   On the other hand, the voice data or incoming message transmitted from the recipient's terminal is converted into a protocol conforming to the internet access standard through the VoIP gateway (60) in the PSTN (70) and transmitted to the internet (50), and the transmission path for the incoming message or voice data transmitted to the internet (50) is controlled by the location register (80). In other words, if it is determined that the location of the user registered in the location register (80) has been changed from outdoors to indoors, the router to which the location register is connected transmits the recipient's voice data or incoming message to the indoor gateway (100) without going through the outdoor wireless LAN network.

<96>   Then, the indoor gateway (100) transmits the recipient's voice data to the user's PDA (10) through Bluetooth to ensure the voice call between the user and the recipient takes place continuously (S17).

<97>   Here, when the HA location register judges that there is an abnormality in the indoor network when the other party transmits the incoming message or that the amount of calls in the indoor network has increased heavily (S18), it uses a different outdoor mobile communication network to allow the call to be made (S19).

<98>   Through the method described above, the present invention enables the user to continue the call without interruption even if the user moves from outdoors to indoors, and in particular, by using the indoor network when indoors, the user can continue to have a call with the recipient at a low cost.

<99>   In addition, the present invention provides the convenience of calling to a user by automatically switching to an outdoor mobile communication network when the indoor network experiences abnormalities during an incoming call or when the indoor network is not available.

<100> Hereinafter, a method for switching connection to a wireless internet network when the location moves indoors/outdoors according to an embodiment of the present invention for the case in which a user moves from outdoors to indoors during wireless internet data communication will be described with reference to Fig. 4.

<101> Fig. 4 is a flowchart for providing an automatic connection switching service when the location moves from outdoors to indoors during wireless data communication according to an embodiment of the present invention.

<102> A laptop PC or a PDA can be used as a mobile data terminal, and the following is a description for the case of using the PDA (10).

<103> Outdoors, when the user turns on the PDA (10), the PDA (10) is initialized and power is applied (S20).

<104> Then, the PDA (10) checks whether the indoor network system information is received through Bluetooth, and if the indoor network system information is not received, it sets the outdoor data communication mode, and connects to the internet using the outdoor wireless LAN network (S21).

<105> At this time, the PDA (10) registers the location by receiving approval from the location register (80) using an outdoor wireless LAN network. [illegible:]

<106> After the description above, when the user moves from outdoors to indoors during internet data communication or after finishing internet data communication, the PDA (10) receives the indoor system ID information broadcasted from the indoor gateway (100) (S22).

<107> Then, the PDA (10) compares the received indoor system ID information with the self-registered indoor system ID information and determines whether it has the authority to use the received indoor system. In addition, if the received indoor system ID information is registered information in the judgment above, the PDA (10) registers the location after receiving authentication based on the mobile IP message using an outdoor or indoor wireless LAN network. [handwritten:] [illegible:]

<108> By way of the registration, the location register (80) confirms that the location of the user has been changed from outdoors to indoors.

<109> When the location registration is authenticated, the PDA (10) switches from the outdoor data communication mode to the Bluetooth mode (S24).

<110> Then, the PDA (10) connects to the indoor network based on the indoor system ID information, and performs wireless communication through the indoor gateway (100) and Bluetooth (A, C) (S25).

<111> Accordingly, data information transmitted from the PDA (10) is transmitted to the indoor gateway (100) through Bluetooth (A), and the indoor gateway (100) transmits it to the internet network (50).

<112> In addition, the reception service provided on the internet is transmitted to the indoor gateway (100) without going through the outdoor wireless LAN network according to the location information of the user registered in the location register (80). Then, the indoor gateway (100) transmits the internet reception service information to the PDA (10) through Bluetooth (C, A) to allow the user to continuously use the internet service through the PDA (10) (S27).

<113> Here, when the HA/FA location register judges that there is an abnormality in the indoor network or that the amount of calls in the indoor network has increased heavily (S28), it uses an outdoor wireless LAN network or a different outdoor mobile data communication network to allow a call to be made between a user and a caller (S29).

<114> Through the method above, the user can continue using the internet data communication without interruption of data communication even when they move from outdoors to indoors, and in particular, the user can continue using the internet data communication at a low cost by using the indoor network when indoors.

<115> Through the method above, when a user using wireless internet data communication moves from outdoors to indoors, the communication connection according to the present invention is automatically switched from wireless internet communication using an outdoor wireless LAN network to wired internet communication using an indoor network.

<116> Here, since the data communication quality of the indoor network is better than the data communication quality of the outdoor network in the present invention, the communication network connection can be automatically switched unconditionally when a user moves from an outdoor network to an indoor network, but this method causes a problem of causing great inconvenience to the user when the data communication quality of the indoor network system is poorer than that of the outdoor network for any reason.

<117> Therefore, the present invention checks whether the quality of the indoor network is worse than the quality of the outdoor network, and switches the connection to the communication network only when the call quality of the indoor network is at least better than the data communication quality of the outdoor network. To this end, the present invention estimates the data communication quality of the indoor network by using an IP datagram loss rate, an IP datagram error rate, retransmission timer operation characteristics, average delay and displacement, and so forth, to perform a call quality comparison with the outdoor network.

<118> Hereinafter, a method for switching connection to a wireless internet network when the location moves to outdoors according to an embodiment of the present invention for the case in which a user moves from indoors to outdoors during wireless internet data communication will be described with reference to Figs. 5 and 6.

<119> Fig. 5 is a flow chart for providing a connection switching service when the location moves from indoors to outdoors during a mobile call according to an embodiment of the present invention, and is the case in which the indoor wireless access module is Bluetooth.

<120> As illustrated in Fig. 5, when the user turns on the PDA (10), the PDA (10) is initialized and power is applied (S30).

<121> Then, the PDA phone (10) receives indoor network system information broadcasted by the indoor gateway (100) at regular time intervals through Bluetooth or through a wireless LAN access module or a wireless packet communication access module, and determines whether the received indoor system ID information matches the stored (registered) indoor system ID information (S31).

<122> When it is determined through the step (S31) that the PDA (10) is indoors, it registers the location by being authenticated by the location register (80) through the outdoor or indoor wireless LAN network.

<123> Here, if the received indoor system ID information does not match the indoor system ID information registered in the PDA, the PDA cannot use the indoor network and uses the outdoor wireless internet network. [illegible:]

<124> On the other hand, when the PDA (10) receives authentication for location registration through the step (S32), the signal to be received later is received through the indoor gateway (100) by the Bluetooth (A, C) communication method.

<125> Upon location registration, the PDA (10) sets Bluetooth mode and connects to the indoor network, that is, the indoor gateway (100) using the received indoor system ID information (S33).

<126> When the PDA (10) accesses the indoor network, it gets wirelessly connected to the indoor gateway (100) through Bluetooth, which enables wireless communication (S34).

<127> Therefore, the voice data signal or call message generated in the PDA (10) is transmitted to the indoor gateway (100) through Bluetooth (A) of the PDA (10), and the indoor gateway (100) receives voice data or a call message through Bluetooth (C) and then transmits it to the internet (50) (S35).

<128> Then, the internet (50) transmits the voice data or call message received from the indoor gateway (100) to the PSTN (70) through the VoIP gateway (60) to enable the user to have an internet call with the recipient (S36, S37).

<129> Here, when a signal requesting transmission of a call message or voice data is received from the PSTN, the HA/FA location register (80) transmits an incoming message or voice data to the indoor gateway (100) according to the location of the user stored in the location register (80). Then, the indoor gate (100) receives voice data and wirelessly transmits it to the PDA (10) through Bluetooth, thereby enabling a roaming service in which a caller and a recipient can have a call.

<130> After the description above, if the user moves from indoors to outdoors while having a wireless call or while not having a wireless call, the PDA (10) becomes unable to receive the indoor system ID information broadcasted from the indoor gateway (100) (S38).

<131> If the PDA (10) is unable to receive the indoor system ID information, it judges that the current location is outdoors, and accordingly, transmits a mobile IP registration message to the outdoor mobile communication network to receive approval for the current location and register it in the location register (80) (S39).

<132> When the location is registered in the location register (80), the PDA (100) switches the mode to the outdoor communication mode (S40).

<133> Then, the PDA (10) uses the outdoor wireless LAN network to ensure that the voice signal is transmitted to the recipient, and receives the voice signal transmitted from the recipient through the outdoor wireless LAN network to enable the recipient and the user to continuously have a call (S41).

<134> Through the above process, mobile calls can be continued without interruption when moving from indoors to outdoors, and when the location moves from outdoors to indoors again, it becomes possible to perform indoor wireless communication through the method of the present invention with reference to Fig. 3.

<135> Hereinafter, an embodiment of the present invention for the case of moving from indoors to outdoors during wireless data communication will be described with reference to Fig. 6. Fig. 6 is a flowchart for providing a connection switching service when the location moves from indoors to outdoors during wireless data communication according to an embodiment of the present invention, and is the case in which the indoor wireless access module is Bluetooth.

<136> As illustrated in Fig. 6, when the PDA (10) is initialized and power is supplied (S60), the PDA (10) receives the indoor system ID information (S61), and accordingly, the location is registered by being authenticated by the location register (80) using an outdoor wireless LAN (S62).

<137> When the location registration is authenticated, the PDA (10) sets the Bluetooth mode (S63), and gets connected to the indoor gateway (100) through Bluetooth (S64).

<138> Thereafter, when the user performs data communication, the data transmitted from the PDA (10) gets connected to the internet (50) through the indoor gateway (100), and the service provided from the internet is received by the indoor gateway (100) and transmitted to the PDA (10) through Bluetooth (S65, S66).

<139> Therefore, it becomes possible for the user to use the information provided on the internet.

<140> After the description above, when the user moves from indoors to outdoors while receiving information from the internet or while not in that state, the PDA (10) cannot receive the indoor system ID information, and accordingly, the current location is registered by being authenticated by the location register (80) through the outdoor wireless internet network (S67, S68, S69).

<141> Then, the PDA (10) switches the Bluetooth mode to the outdoor communication mode, and after connecting to the internet using an outdoor wireless LAN, receives an internet data service (S70, S71).

<142> In the description above, indoor may refer to inside a structure or inside a certain structure, such as a building and a house, and in particular, may refer to within a radius capable of receiving the same indoor system ID information as the indoor system ID registered in the data communication terminal. In other words, the area in which the data communication terminal cannot receive indoor system ID information may be referred to as outdoors, and an area in which indoor system ID information can be received may be referred to as indoors.

<143> In addition, the description with reference to Figs. 3 to 6 has described the case in which the indoor wireless access module is Bluetooth, but the implementation will be easy for a PHOSITA even in the case of using a wireless LAN access module or a wireless packet communication access module as the indoor wireless access module.

<144>   The technical idea of the present invention has been described above with the accompanying figures, but this is an illustrative description of a preferred embodiment of the present invention and does not limit the present invention. In addition, it is clear that a PHOSITA will be able to make various modifications and imitations within the scope of not departing from the scope of the technical idea of the present invention.

[Effect of the present invention]

<145> The present invention has the effect of improving internet voice quality and data processing speed and reducing usage fees by making it possible to switch the connection to the optimal communication network according to the user's location when the user changes their location from outdoors to indoors or from indoors to outdoors.

<146> In addition, the present invention has an effect of allowing the users to make calls with confidence by enabling the communication route received at the indoor network to be automatically roamed to the outdoor wireless internet network for the case in which the amount of traffic increases heavily or there is an abnormality in the indoor network.

[Scope of claims]

[Claim 1]

An optimal internet network access/roaming system for users moving indoors/outdoors,

Wherein the optimal internet network access and roaming system for users using an outdoor wireless internet network comprising an antenna, a router, and a location register, and an indoor network comprising an indoor gateway capable of connecting to the internet network comprises,

A data communication terminal having a built-in indoor wireless access module, registered with indoor system ID information, and connecting to the indoor network when the registered indoor system ID information is received and connecting to the outdoor wireless internet network when the registered indoor system ID information is not received to receive a communication service;

An indoor gateway having the built-in indoor wireless access module, broadcasting the indoor system ID information, performing wireless communication with the data communication terminal through the indoor wireless access module, and connected to the internet network by wire;

A location register for storing location information of the data communication terminal transmitted through the indoor and outdoor wireless internet network; and

A router for judging the location of the data communication terminal stored in the location register, and roaming the voice/data signal provided to the user by selecting either an outdoor or indoor network according to the location of the data communication terminal.

[Claim 2]

The optimal internet network access and roaming system for users of claim 1,

Wherein the data communication terminal,

Compares the received indoor system ID information with the stored indoor system ID information, and sets either the indoor more or the outdoor communication mode depending on whether the received indoor system ID information is the same as the registered indoor system ID information.

[Claim 3]

The optimal internet network access and roaming system for users of claim 1,

Wherein the data communication terminal,

Is registered with one or more indoor system ID information.

[Claim 4]

The optimal internet network access and roaming system for users of claim 1,

Wherein the data communication terminal,

Registers the location based on the mobile IP on the location register to notify that it is indoors when the registered indoor system ID information is received, and stores the location area information in the location register to notify that it is outdoors when the registered indoor system ID information is not received.

[Claim 5]

The optimal internet network access and roaming system for users of claim 4,

Wherein the data communication terminal,

Registers the location change for the location registered on the location register from indoors to outdoors during a call and if approved, the connection is switched from an indoor network to an outdoor wireless internet network, or if the location change from outdoors to indoors is registered and approved, the connection is switched from an outdoor wireless internet network to an indoor network.

44-32

[Claim 6]

    The optimal internet network access and roaming system for users of claim 1,

    Wherein the location register,

    Is either a home agent or a foreign agent.

[Claim 7]

    The optimal internet network access and roaming system for users of claim 1,

    Wherein the indoor gateway,

    Is either a home gateway or an IAD.

[Claim 8]

    The optimal internet network access and roaming system of claim 1,

    Wherein the indoor wireless access module, is Bluetooth.

[Claim 9]

The optimal internet network access and roaming system of claim 1,

Wherein the indoor wireless access module, is a wireless LAN access module. [handwritten:] [illegible:]

[Claim 10]

The optimal internet network access and roaming system of claim 9,

Wherein the indoor gateway, is an internet communication device connected to a wired or wireless LAN.

[Claim 11]

The optimal internet network access and roaming system of claim 1,

Wherein the indoor wireless access module is a wireless packet communication access module.

[Claim 12]

An optimal internet network access and roaming method for users,

Wherein the optimal internet network access and roaming method for users using an outdoor wireless internet network comprising an antenna, a router, and a location register, and an indoor network comprising an indoor gateway capable of connecting to the internet network comprises,

A first step for accessing the outdoor wireless internet network from outdoors to receive a communication service;

A second step for determining whether the received indoor system ID matches the registered indoor system ID when the indoor system ID information is received after the first step;

A third step for registering the indoor location on the location register and obtaining approval if the two IDs match;

A fourth step for switching connection from the outdoor wireless internet network to the indoor gateway, and connecting to the internet network by wireless communication through the indoor gateway and the indoor wireless access module;

A fifth step for receiving the data through the indoor gateway and the indoor wireless access module when the data provided from the internet network is transmitted to the indoor gateway according to the location information registered in the location register;

A sixth step for registering the outdoor location on the location register and obtaining approval if the indoor system ID information is not received after the fifth step; and

A seventh step for switching connection from the indoor gateway to the outdoor wireless internet network, and performing the first step.

[Claim 13]

The optimal internet network access and roaming method for users of claim 12,

Wherein the indoor location registered on the location register is updated by including the indoor system ID.

[Claim 14]

The optimal internet network access and roaming method for users of claim 12,

Wherein the second step,

Compares a plurality of indoor system ID information registered in the data communication terminal and the received indoor system ID information, and determines whether there is a match with the received indoor system ID information among a plurality of registered indoor system ID information.

[Claim 15]

The optimal internet network access and roaming method for users of claim 14,

Wherein the data communication terminal and the indoor gateway,

Have the indoor wireless access module built-in.

[Claim 16]

The optimal internet network access and roaming method of claim 12,

Wherein the indoor wireless access module, is Bluetooth.

[Claim 17]

The optimal internet network access and roaming method of claim 12,

Wherein the indoor wireless access module, is a wireless LAN access module.

[Claim 18]

The optimal internet network access and roaming method of claim 17,

Wherein the indoor gateway is an internet communication device connected to a wired or

wireless LAN.

44-36

[Claim 19]

The optimal internet network access and roaming method of claim 12,

Wherein the indoor wireless access module is a wireless packet communication access module.

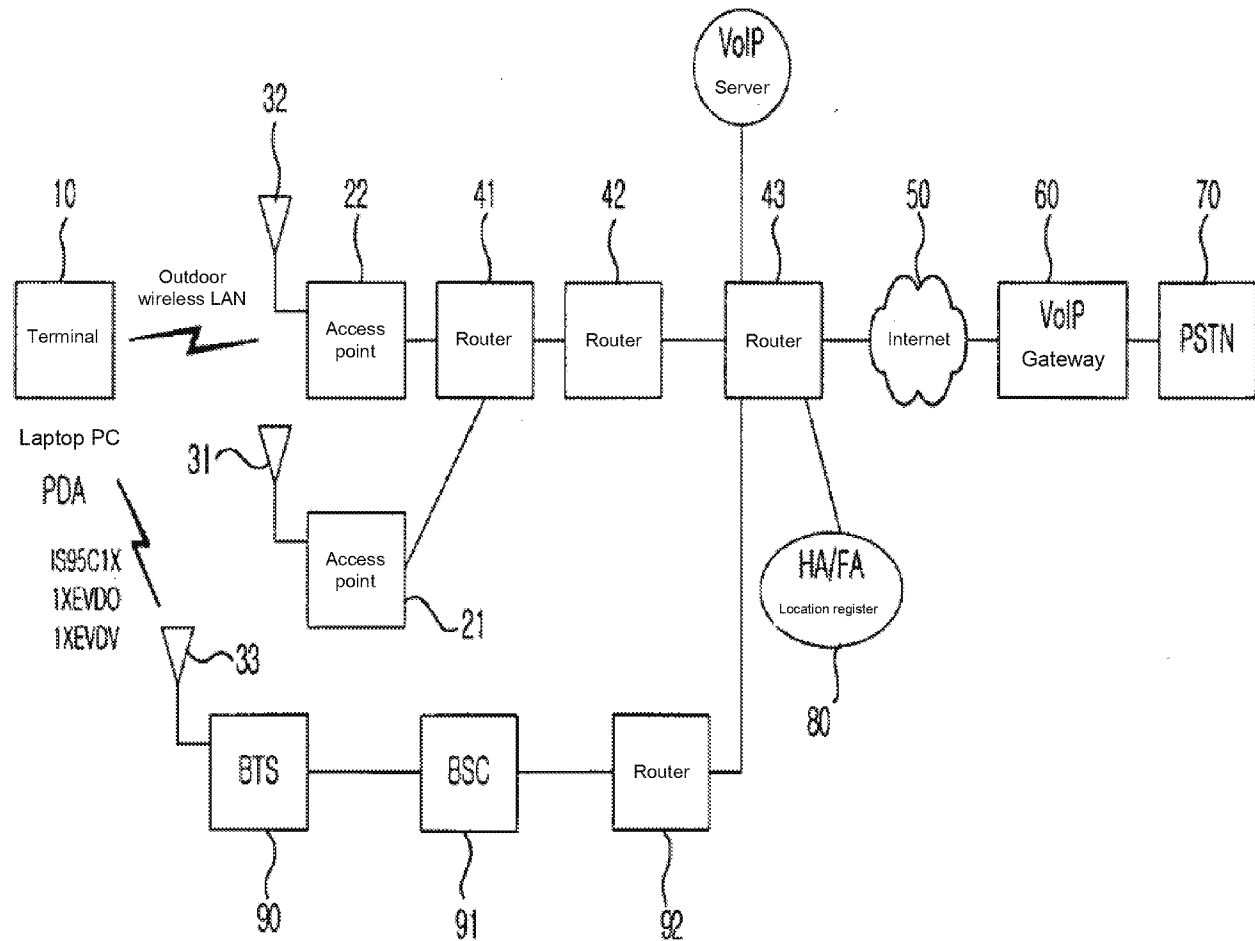[Claim 20]

The optimal internet network access and roaming method of claim 12,

Wherein the second step,

Is performed while receiving a communication service.

[Claim 21]

The optimal internet network access and roaming method of claim 12,

Wherein the second step,

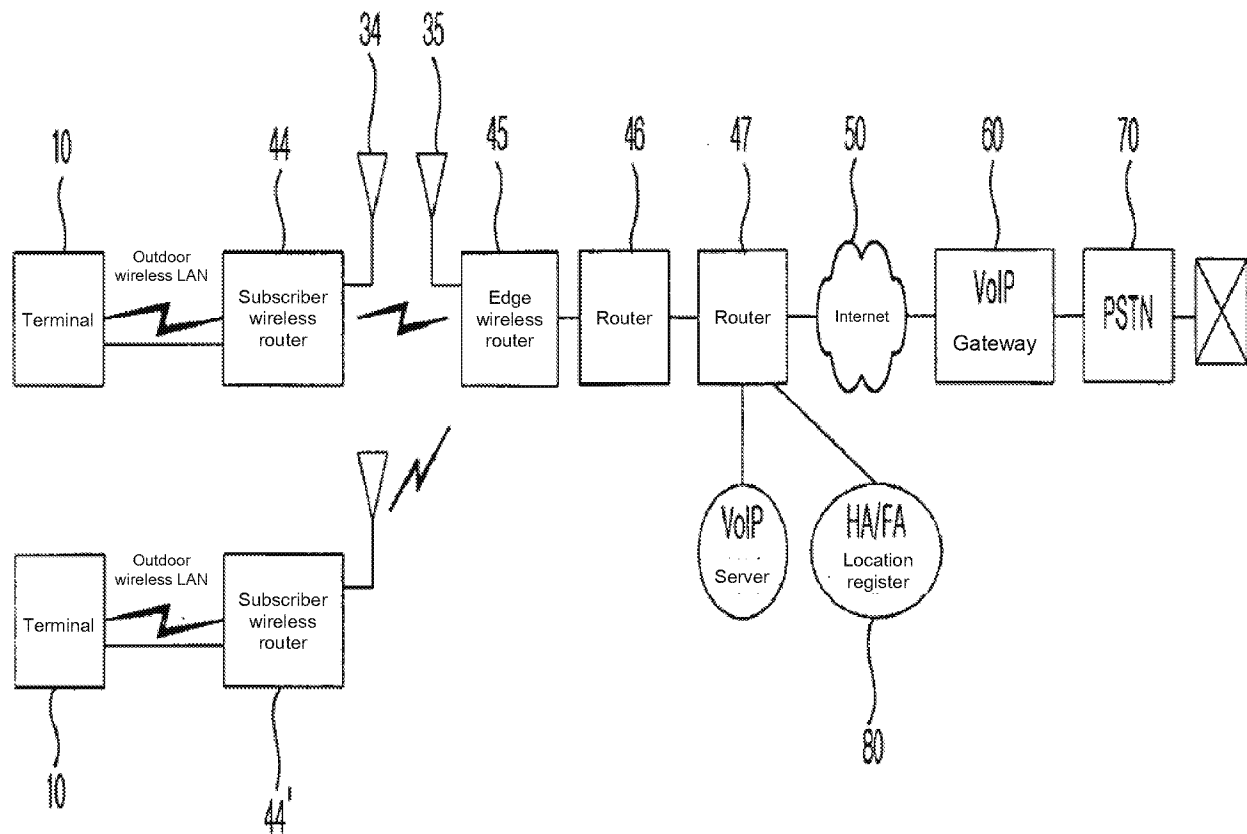Is performed when the provision of a communication service is finished.

44-37

[Figures]

[Fig. 1a]

[Fig. 1b]

[Fig. 2]

[Fig. 3]

[Fig. 4]

```
                        ┌─────────────┐
                        │    Start     │
                        └──────┬──────┘
                               │
                        ┌──────┴──────────┐
                        │ PDA initialization │    S20
                        └──────┬──────────┘
                               │
                    ┌──────────┴────────────────────┐
                    │ Internet data communication through │   S21
                    │ an outdoor wireless internet network │
                    └──────────┬────────────────────┘
                               │
          No          ◇─────────────────◇
        ◄─────────────  Registered reception,    S22
                        indoor system ID
                        ◇─────────────────◇
                               │ Yes
                    ┌──────────┴────────────────────┐
                    │ Register and authenticate the location │
                    │ change on the location register based  │  S23
                    │ on mobile IP through the indoor/outdoor │
                    │ network │
                    └──────────┬────────────────────┘
                               │
                    ┌──────────┴────────────────────┐
                    │ Switch to Bluetooth communication mode │  S24
                    └──────────┬────────────────────┘
                               │
                    ┌──────────┴────────────────────┐
                    │ Wireless communication with the indoor │  S25
                    │ gateway via Bluetooth │
                    └──────────┬────────────────────┘
                               │
                    ┌──────────┴────────────────────┐
                    │ Wired internet connection through the  │  S26
                    │ indoor gateway │
                    └──────────┬────────────────────┘
                               │
                    ┌──────────┴────────────────────┐
                    │ Receive internet data service through  │  S27
                    │ the indoor gateway │
                    └──────────┬────────────────────┘
                               │
          No          ◇─────────────────◇
        ◄─────────────  Heavy increase in the number
                        of calls or abnormalities in   S28
                        the indoor network?
                        ◇─────────────────◇
                               │ Yes
                    ┌──────────┴────────────────────┐
                    │ Use the outdoor wireless internet      │  S29
                    │ network │
                    └──────────┬────────────────────┘
                               │
                        ┌──────┴──────┐
                        │     End      │
                        └─────────────┘
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44-42
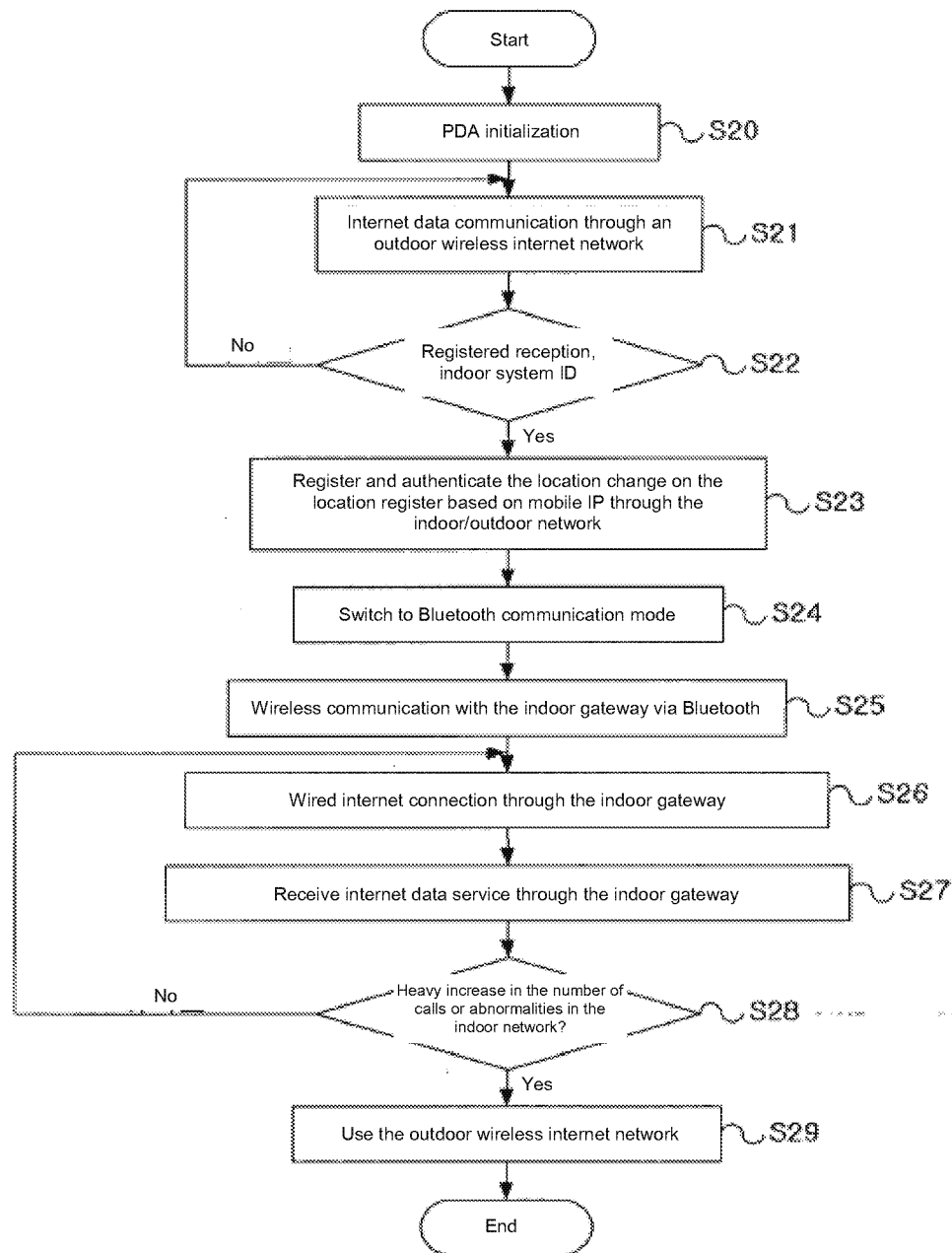
[Fig. 5]
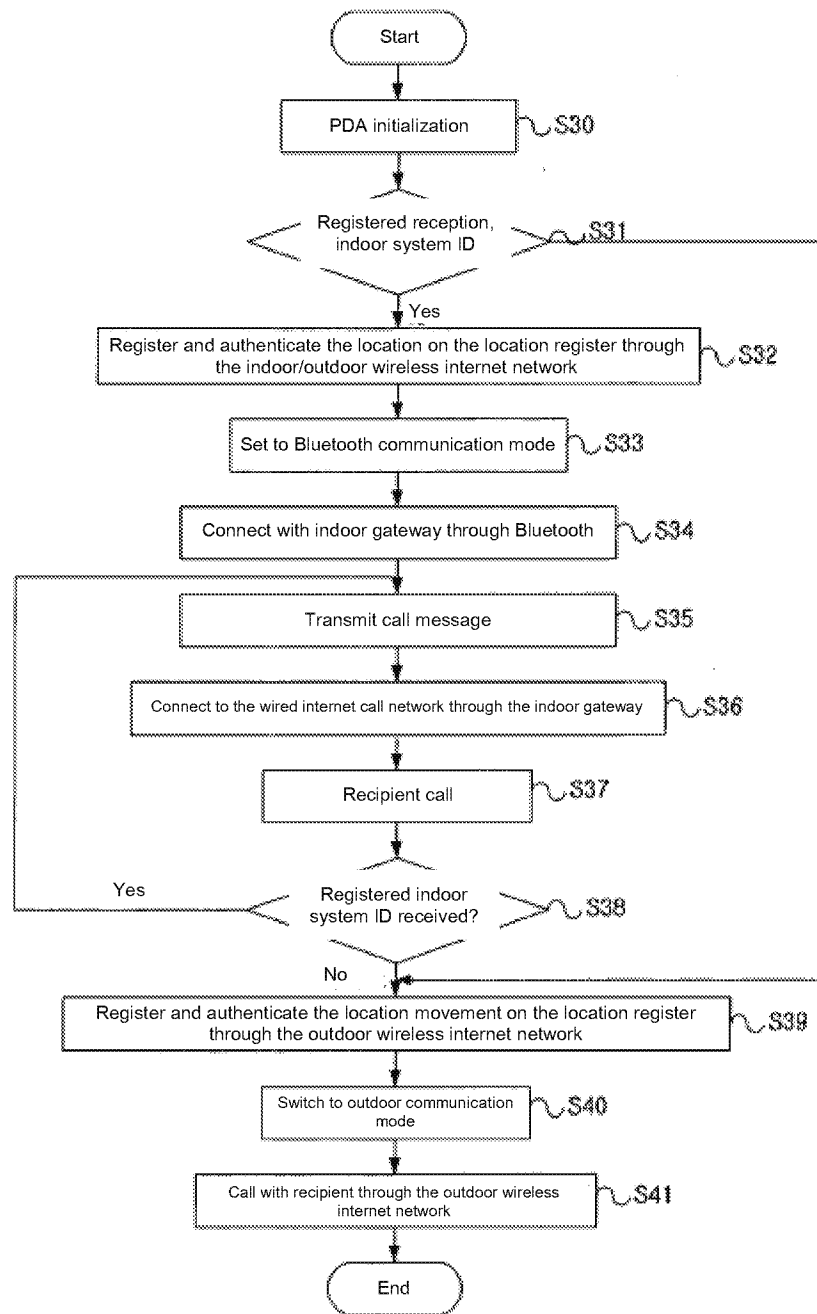
[Fig. 6]
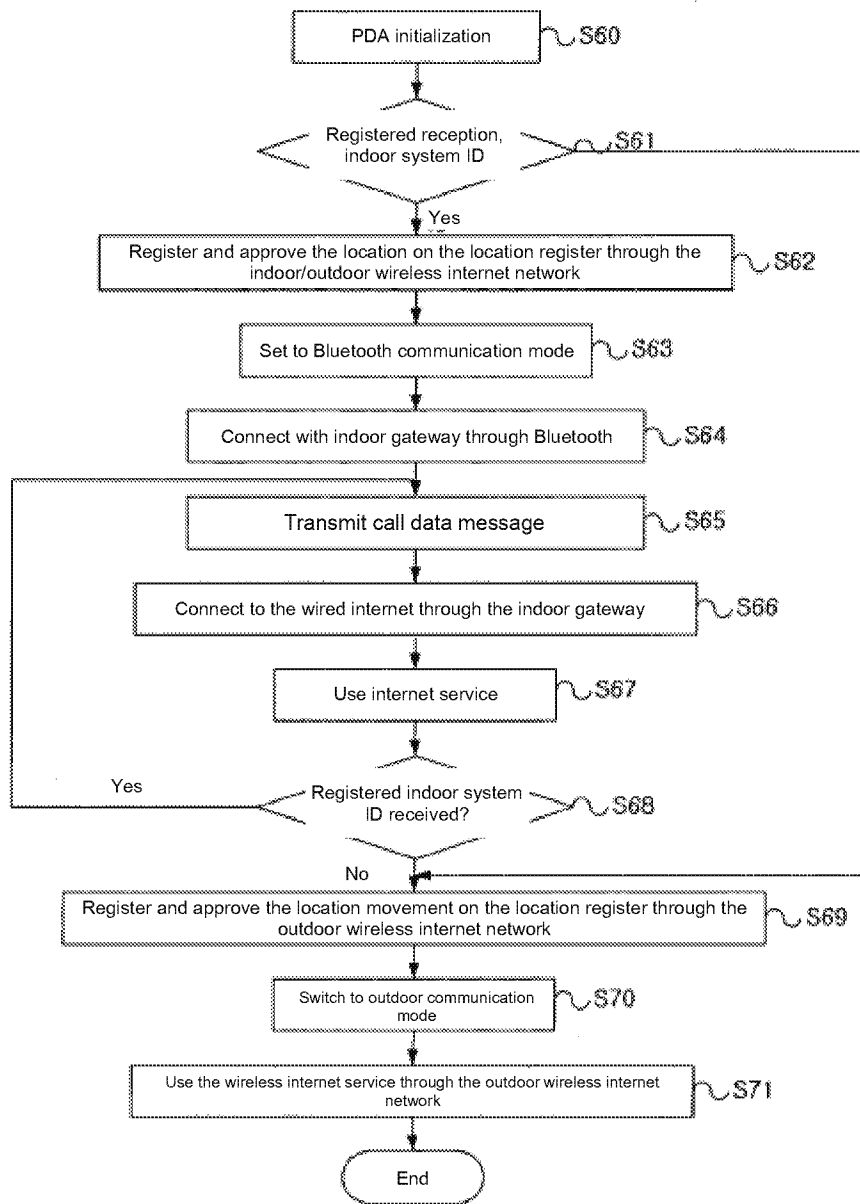
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